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Prosodic Structure and the Emergence of the Coda in EP: A case study

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RÉSUMÉ

Ce travail est fondé sur une base de données *LumaLiDa* (Laboratório de Fonética, FLUL) composée d'enregistrements d'une enfant de langue portugaise (Portugais Européen ou PE) couvrant la période de 8 mois à 3 ans. Dans cet article, on examine le rôle de la structure prosodique et de la proéminence dans l'émergence des segments en position de coda. L'enfant à 3 ans n'est pas capable de produire 80% des codas présentes dans la cible adulte. C'est pour cette raison que nous avons porté une attention particulière aux stratégies de réparation, qui sont très variées dans les données. Nos résultats montrent l'importance de la proéminence et de la position finale de mot, de syntagme phonologique et de syntagme intonatif dans les réalisations ou non des codas et dans les stratégies de réparation.

1. INTRODUCTION

The *corpus* under analysis is based on a linguistic diary, stored in a linguistic database: Frota, Vigário & Jordão (2008) ***LumaLiDaOn*** (Version 1). Lisbon: Laboratório de Fonética da FLUL.

That data provided 3806 codas that have been analysed looking for the role of prosodic structure regarding emergence.

The paper is organized as follows: Section 2 will explain the methodology used and Section 3 will cover the data. Section 4 will look for the role of prosodic structure focusing on the (non-)presence of codas (CP and CNP). Conclusions from these preliminary results will be dealt with on Section 5.

2. METHODOLOGY

The analysis has been organized as follows:

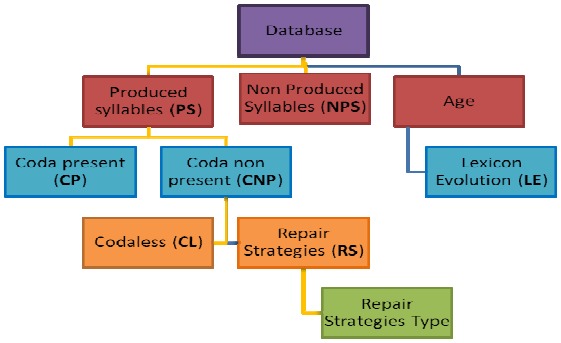

Figure 1: Analysis diagram

This work compares the **Target Codas - T** with the **CP** and **CNP** parameters.

For each parameter - Target codas, Non-produced syllable, Produced syllables, Coda present, Coda non-present, Codaless, Repair Strategies - shown in the diagram, the following variables were analysed:

- Stress and prominence
- Segment Position: Initial, Internal, Final of Prosodic Word (PW), Phonological Phrase (PhP) and Intonational Phrase (IntP).
- Syllable Position: Initial, Internal, Final of PW, PhP and IntP
- Segment Type
- Age

The variables **Age** and **Segment type** were crossed.

The examples that will be shown further on use the SAMPA alphabet as a tool for phonetic transcription.

DATA OVERVIEW

Target

The percentage of **CP**, **CL** and **RS** is given in 3.1.1. The percentage of utterances with one or more than one PW is shown in 3.1.2:

Production

- CP..... 2,44%
- CL 80,24%
- RS..... 17,31%

Number of words

- 1 PW..... 13,29%
- > 1 PW 86,71%

Segment Type

In EP, the segments available to fill the coda position are: fricatives, the realization of which is dependent on sandhi phenomena, and liquids, hereafter /S/, /l/ and /ɾ/.

Freitas [Fre97] established an order for the emergence and settling of those segments, stating that the first ones to appear are fricatives and then emerge the other two.

Costa [Cos03] and Correia [Cor04] confirmed this order too.

However, fricatives are also the most frequent segment in the target, being the distribution of the segments as follows: /S/ - 53,23%; /ɫ/ - 7,52% and /ɾ/ - 37,52%

Nevertheless the child doesn't produce most of the fricatives occurring in the target, because the percentage of CP is 4,00% and of CNP is 60,80%. The remainder 35,20% belongs to syllables that have not been produced.

Stress and Prominence

The prosodic phrases structure in EP relevant to the present study are described below.

PW consists of a stem plus suffixes. Clitics (that is, stressless items) are incorporated into the host PW when enclitics, and proclitics as well as prefixes are adjoined to the following PW (Vigário [Vig03], [Vig08]).

PhP consists of a Lexical head + all elements to the left within the Maximal projection of Lex, and a following XP *complement* if containing just one PW). By default, prominence within the PhP is rightmost: the final PW is the PhP-head (Frota [Fro00]).

IntP groups all adjacent PhPs within a root sentence; PhPs in a string not structurally attached to the sentence tree form an independent IP on their own (e.g. parenthetical phrases, explicative phrases / clauses, tags, vocatives, topics), according to Frota [Fro00]

IntPs are constrained by weight conditions: long phrases tend to be divided, balanced phrases or the longest phrase in the rightmost position is preferred (Frota [Fro00]; Elordieta, Frota & Vigário [EFV05]). Prominence within the IP is rightmost, by default (Frota [Fro00]).

Table 1 shows the distribution of stress and prominence

Table 1: Stress and Prominence[1]

	0	1	1SP	2	2SP	3
PW	42,46%	57,54%				
PhP			10,93%	46,56%		
IntP					18,37%	28,30%

Segment Position

In the target around half of the codas occur in final position, relatively to PW (51,97%) and PhP (41,51%). Regarding IntP, around a quarter is final.

Syllable Position

The data includes a great percentage of monosyllabic words (23,02%), and the values for the final position are: 33,15% for PW, 38,15% for PhP and 24,25% for IntP.

[1] PW: 0-stressless; 1-stressed. PhP 1SP-stressed non-head of PhP ; 2-head of PhP. IntP: 2SP - head of PhP non-head of IntP; 3 - head of IntP

Summary

This view of the target data shows the importance both of prominence and final position in the prosodic word and prosodic phrase.

3. Looking for the Role of the Prosodic Structure

In this section, the child's behaviour will be analysed, and the CP and CNP parameters compared.

Coda Present (CP)

Age. According to Freitas [Fre97], a branched rhyme emerges at a later stage of the acquisition process.

Figure 2 shows that the larger number of codas, in the target, occurs around 2:05. Nevertheless, the CP parameter reaches the greater expression, only when the child is about 3;00 years old

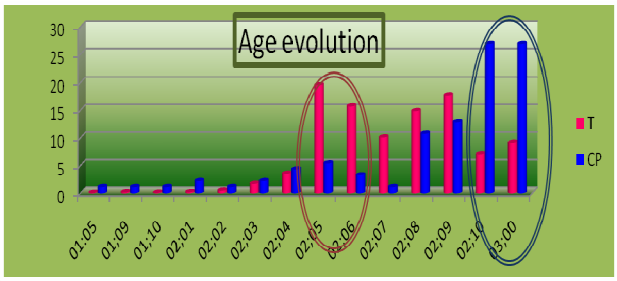

Figure 2: Age evolution, comparing T and CP.

The examples in (1) and (2) illustrate this difference:

v"6mu	$[[vamos)_{\omega}]_{\varphi}]_{I}$ (let's go)	02;05.24	(1)
n"6~w~ p@siz"6muS	$[[(não)_{\omega}$ $(precisamos)_{\omega}]_{\varphi}]_{I}$ (we don't need it)	02;11.20	(2)

Stress and Prominence. Regarding stress, and at the PW level, Correia [Cor04] reports that the order of emergence is fricatives then liquids. This author also establishes that the latter emerge earlier in stressed syllables than in those without stress.

The results of this work are:

CP – 0 – 46,24%; 1 – 53,76%; 1SP – 21,55%%; 2 – 31,18%; 2SP – 9,68%%; 3 – 22,58%.

A comparison with Table 1 above shows that the child follows the trend of the target. The stressed syllables are clearly more relevant.

(3) and (4) present two utterances with stressed syllables, the former with a liquid coda and the latter with a fricative coda.

u~ kOk"Ol	$[[(um\ (caracol)_{\omega})_{\omega}]_{\varphi}]_{I}$ (a snail)	02;06.19	(3)
k"Eru m"ajS	$[[(quero)_{\omega}\ (mais)_{\omega}]_{\varphi}]_{I}$ (I want more)	02;08.08	(4)

Syllable Position. There are not many acquisition studies, either on EP or other languages, which deal with the prosodic units above the syllable.

Gerken [Ger96] reports that children omit, more easily, weak than strong syllables.

Since the prosodic structure in EP doesn't comprise the foot unit, the above mentioned work can be compared to the syllable position relatively to the higher constituents. Being a right-recursive language, one may say that final position is 'strong' in EP. Overall X?% of CP appear in prosodic final position (Figure 3).

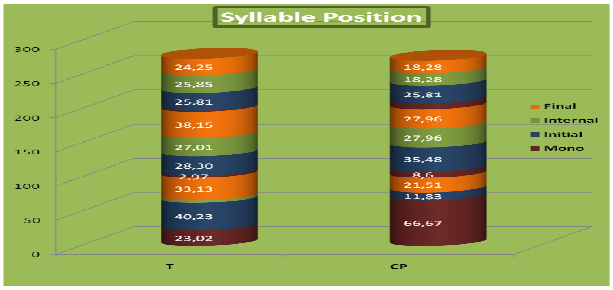

Figure 3: Position of the syllable in all constituents.[2]

The example in (5) shows a coda produced in a final syllable of all the constituents under analysis.

u~ kaval"iJu nu s"ew k6lOs"E**l**	[[(um (cavalinho)$_{\omega}$)$_{\omega}$]$_{\varphi}$ [(no (seu)$_{\omega}$)$_{\omega}$ (carrosse**l**)$_{\omega}$]$_{\varphi}$]$_{I}$ (a little horse in its merry-go-round)	02;07.19	(5)

Segment position. Correia [Cor04] also states that, besides word stress, the coda segments, especially the liquids, are more stable in final position, once again at a word level.

However, our preliminary results show that fricatives are the most stable segments, and that final position plays a major role at the prosodic word and higher prosodic levels. The results may be seen in the following table

Table 2: Segment position

		Initial	Internal	Final
T	PW	13,72%	34,31%	51,97%
	PhP	9,56%	14,58%	41,51%
	IntP	6,12%	19,15%	25,80%
CP	PW	5,38%	32,26%	62,37%
	PhP	3,23%	26,88%	37,63%
	IntP	2,15%	10,75%	27,96%

In EP, only the palatal fricative can occur in initial position, and that happens only when the nucleus is a medial and high vowel, which is very common in EP, namely in [St"a], the EP correspondent to *'be-there'*.

The example in (6) shows a produced fricative and the lack of the vowel which occurs also in adult speech.

s**t**"el6	[[(**es**trela)$_{\omega}$]$_{\varphi}$]$_{I}$ (star)	02;10.09	(6)

Summary. From the comparison of the T and CP parameters one may conclude that fricatives emerge earlier and that stress and final position are highly relevant at all levels of the prosodic hierarchy.

Coda not Present (CNP)

The CNP parameter has two branches:

- Codaless (CL)
- Repair Strategies (RS)

In the following sections these two parameters will be compared. However, since the most relevant variables in our data are stress and prominence, as well as final position, the analysis of CNP will focus on these two variables:

Stress and Prominence. Once again and comparing the two branches of the CNP parameter, the predominance of stress and prominence is notorious, especially in RS. The results in Figure 4 show it.

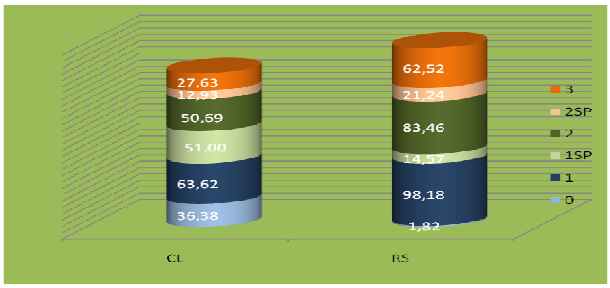

Figure 4: Stress and prominence[3]

Segment Position. The difference is also noticeable with respect to segment position. That can be seen in Table 3.

Table 3: Segment position

		Initial	Internal	Final
CL	PW	0,36%	46,38%	53,72%
	PhP	0,31%	11,24%	42,11%
	IntP	0,13%	18,30%	23,94%
RS	PW	-	6,22%	93,78%
	PhP	-	15,78%	78,15%
	IntP	-	20,94%	57,06%

Let us see an example of a repair strategy:

s6~j~ "a**li**	[[(sem (a**r**)$_{\omega}$)$_{\omega}$]$_{\varphi}$]$_{I}$ (airless)	02;05.16	(7)

Repair Strategies Type. Repair strategies appeared only when the child was 2;02 old, and she uses a wide variety of them

[2] The orange colour marks the place where a constituent ends and another begins.

[3] The decoding of the legend is the same of Table 1.

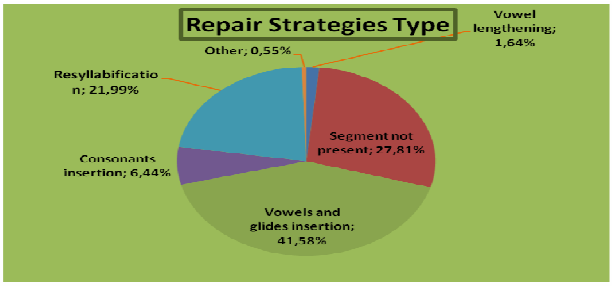

Figure 5: Variety of RS type.

Despite the large variety of RS, insertions are predominant and among these the insertion of vowels and glides.

Figure 6 shows the distribution of vowel insertion.

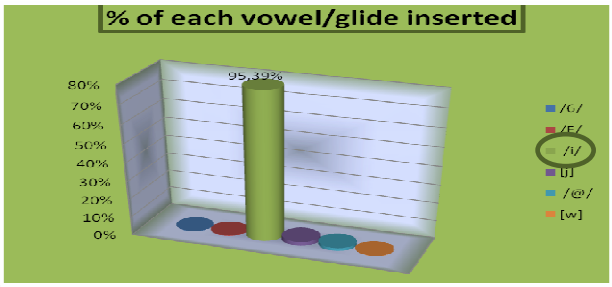

Figure 6: Percentage of vowels and glides inserted

Vowel and glide insertion may be seen in (7), (8) and (9):

tat"a n"6~w~ k"Ej "eti	[[(a (Luma)$_\omega$)$_\omega$]$_\varphi$[(não)$_\omega$ (quer)$_\omega$ (este)$_\omega$]$_\varphi$]$_I$ (Luma doesn't want this one)	02;0530	(8)
des_a"e k6"iw	[[(deixei)$_\omega$ (cair)$_\omega$]$_\varphi$]$_I$ (I've let it drop)	02;05.15	(9)

Table 4 shows that the presence of RS depends on prosodic variables.

Table 4: Vowel insertion *vs* stress and segment position

0	1	1SP	2	2SP	3
0,99%	99,01%	15,32%	83,69%	21,75%	61,94%

PW		PhP		IntP	
Internal	Final	Internal	Final	Internal	Final
3,95%	96,05%	16,47%	79,74%	22,08%	57,50%

4. CONCLUSIONS

Fikkert [Fik94] and Freitas [Fre97] state that the coda position emerges later on in the acquisition process. The results of this work confirm its later emergence, since the CL parameter reaches a value of around 80%., although we have no data to compare branching rhymes with branching nucleus or complex onsets. This is the subject of future work.

Regarding the prosodic structure, the role played by stress in the syllable and by the final position in the word confirms what was previously observed in the literature (but note that in prior work the PW was not considered as such). As to the higher prosodic constituents, that have been considered for the first time in acquisition studies on EP, we have shown that both phrasal prominence and final position in the phrase have an important role.

Finally, as a first answer to the key question behind this work - Does the prosodic structure play an important role in the emergence of coda segments? – we may respond "yes", according to our preliminary results. Nevertheless, further analysis will provide more detailed results.

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